FOREST PRODUCTS
Project Fact Sheet

A REAL-TIME ON-LINE ULTRASONIC SENSOR TO MEASURE PULP CONSISTENCY AND DEGREE OF REFINING

BENEFITS

- Provides a tool for quality and process control
- Increases energy efficiency
- Decreases operational production costs
- Reduces the amount of paper for recycling
- Permits detection of chemically over-pulped, over-bleached, and other lower quality pulp prior to refining

APPLICATIONS

The successful demonstration of a real-time, on-line ultrasonic pulp characterization probe would predict both the quality and quantity of end-products at pulp and paper mills. Operators could apply this advanced knowledge to end-line systems operation. This technology could be rapidly commercialized and added to existing paper and recycling mills.

An In-Situ, Ultrasonic Probe will Determine Pulp Properties and Their Changes

Both the quantity and quality of paper produced is determined by the physical characteristics of refined pulp. Predicting these properties would allow mills to eliminate the production of lower quality paper, thereby minimizing energy and associated operating costs. Since ultrasonic probes for characterizing slurry on-line in vessels and pipelines have been developed, there is evidence that this method could work for pulp and paper stock characterization.

Researchers at Pacific Northwest National Laboratory (PPNL) propose that: ultrasonic signal responses from reflection and transmission at a slurry interface; speed -of-sound through the slurry; penetration and attenuation through the slurry as a function of signal frequency; and resonant frequency in the slurry can reveal and track changes in pulp composition, water retention value, and degree of refining. The slopes and magnitudes of the ultrasonic attenuation spectra generated by the on-line, real-time probe would define pulp fiber length, water retention, fiber external and internal splitting, generation of fines, and tell if it was hardwood or softwood fiber. Information gathered through this technology could increase the energy efficiency and production of mills by providing an instrument for process and quality control

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PROJECT DESCRIPTION

Goal: To develop a real-time, on-line ultrasonic instrument capable of detecting pulp properties

This two year project will devise a proof-of-concept sensor through laboratory tests the first year and exhibit a pilot-scale probe at the Weyerhaeuser plant the second year. Year one has four tasks and year two has three, outlined below:

Year 1: Proof-of-Concept Activities

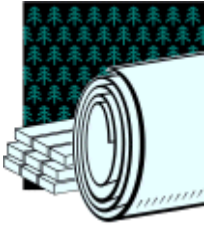
1. Transducer scoping tests
2. Laboratory probe configuration
3. Ultrasonic signal characterization and response tests
4. Go/No-Go decision point

Year 2: Probe Demonstration and Commercialization

1. Probe configuration and pilot plant demonstration
2. Recommendation for mill demonstration
3. Commercialization and licensing

PROGRESS & MILESTONES

- Successful data gathering, coupled with the physical relationships that describe certain components of the systems, support the ability of ultrasonics to provide a tool for real-time pulp characterization.
- Investigations determined that, although it can be reduced by certain measures, entrained air affects attenuation.
- Attenuation and time-of-flight data were obtained.
- Tests were conducted at the Weyerhaeuser pilot plant to investigate effects of entrained air present during pulp mixing and pipeline transport.
- Data is undergoing analyzation to determine bubble content and the influence of pressure on bubble size distribution.
- Tests were conducted over a range of consistencies to verify that effects of consistency could be observed.
- Initial backscatter testing shows a distinct difference in backscattered signals between unrefined and refined pulp. Preliminary analyses indicate that this method can provide additional information about the size of structure in the pulp and about the spatial location of the structures in pulp specimens.
- Plans are underway for a assembly of a transducer housed in a pipe that can be tested under both stationary and flowing conditions.
- Contacts were established with two companies that develop and market instrumentation and sensors for use in the pulp and paper industry.



PROJECT PARTNERS
Pacific Northwest National Laboratory
Richland, WA

University of Washington
Seattle, WA

Exponent, Inc.

Weyerhaeuser Company
Federal Way, WA

FOR ADDITIONAL INFORMATION PLEASE CONTACT:

Gideon Varga
Office of Industrial Technologies
Phone: (202) 586-0082
Fax: (202) 586-3237
e-mail: gideon.varga@ee.doe.gov

Judith Bamberger
Pacific Northwest National Laboratory
P.O. Box 999
MSIN K7-15
Richland, WA 99352
Phone: (509) 375-3898
e-mail: judith.bamberger@pnl.gov

Please send any comments, questions, or suggestions to webmaster.oit@ee.doe.gov

Office of Industrial Technologies
Energy Efficiency and Renewable Energy
U.S. Department of Energy
Washington, D.C. 20585

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